Beneficial Approaches for Controlling Brucellosis

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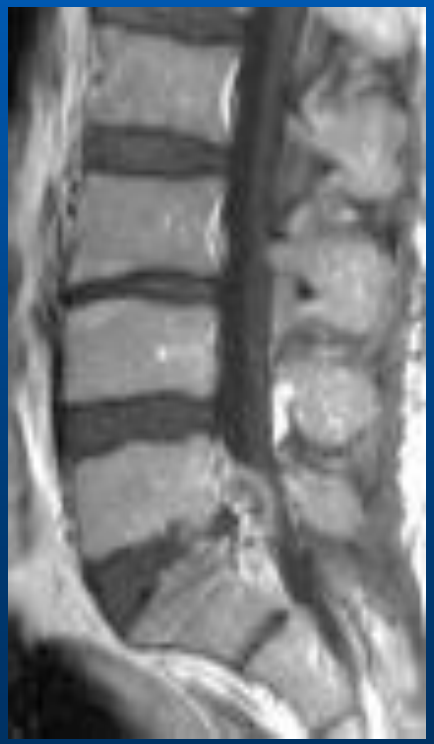
Human Brucellosis



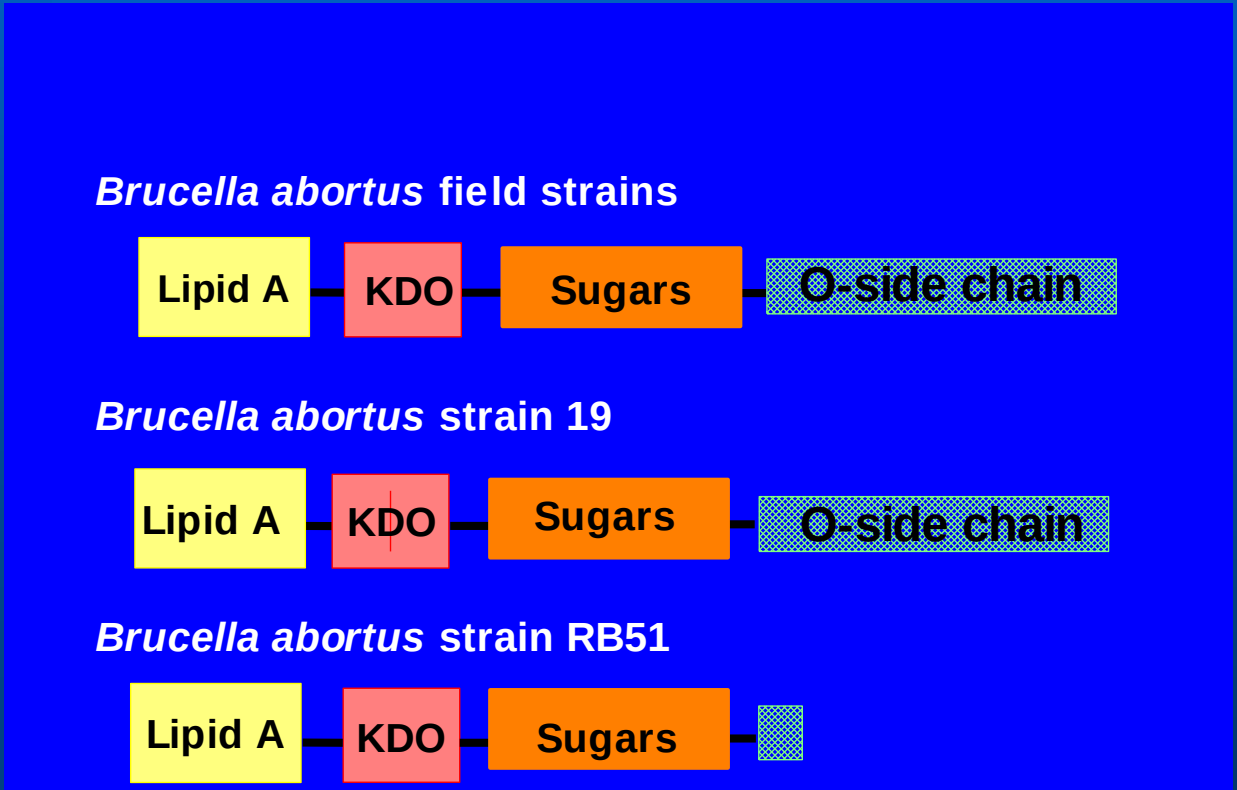
Components of a Control Program

- **Surveillance**
- **Vaccination**
- **Quarantine/Removal of Infected/Risk Reduction**
- **Sanitation**
- **Trained Personnel, Records, Movement Control**
- **Regionalization**

Surveillance

- **Serologic testing**
  - **Sales and abbatoirs (first point testing)**
  - **Change of ownership**
  - **Interstate movement**
- **Periodic Herd testing**
  - **i.e. Milk testing**
- **Trained epidemiologist determines infected versus false positives**

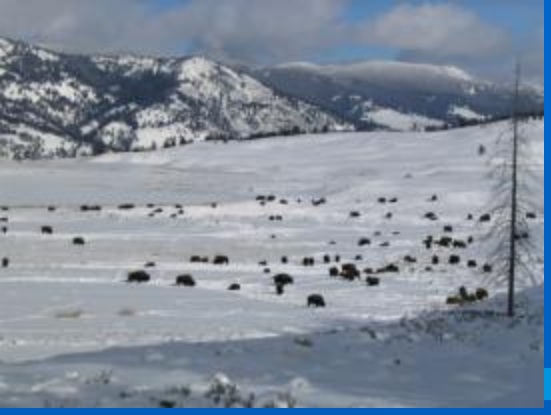
Lipopolysaccharide structure of virulent and vaccine strains



The O-side chain is the immunodominant antigen of *Brucella* for antibody responses

Vaccination

- **Approved for use by species based on *Brucella* infection**
- **May need to be regulated due to zoonotic and abortigenic potential**
- **Could be used as a regulatory method to limit livestock movement**



Thoughts on Brucellosis Vaccines

- Vaccination alone will not eradicate brucellosis
- Vaccines are very good at reducing transmission and clinical disease; very poor at preventing seroconversion after exposure
- Long-term protection related to cell-mediated immunity
- Antibodies relatively unimportant for efficacy
- Many vaccine strains can be pathogenic in humans or pregnant animals

BrucellosisVaccines Available

- ***B. melitensis*:** **strain Rev1 (small ruminants)**
- ***B. suis*:** **none**
- ***B. abortus*** **strains 19 or RB51, 45/20 (cattle)**
- ***B. canis*** **none**
- ***B. ovis*** **none**

Quarantine/Removal/Risk Reduction

- **Quarantine is a way to isolate infection or prevent introduction**
- **Removal of infected animals is used in many countries but may be cost prohibitive**
- **Risk Reduction – evaluate husbandry practices to identify ways to prevent transmission of brucellosis**

Sanitation

- **Segregate animals at parturition**
- **Remove and burn afterbirth/aborted fetuses to prevent fomite transmission**
- **Sanitize fluids/materials which may be route of transmission (i.e. milk)**

Trained Personnel/Records/Animal Movement

- **Use personnel with knowledge of procedures and program**
- **Maintain records (vaccination, testing, etc) to allow assessment at later times**
- **Infrastructure/Teamwork/Communication**
- **Brucellosis is usually spread by animal movement**
- **Animal Identification Essential**
- **Control of Testing**

Containment of Infection: Control or Eradication Programs

- **Identify herd of origin and exposed herds/flock**
- **Herd/flock or area plan**
- **Quarantine and/or depopulation**
- **Permanent marking of infected animals**
- **Sanitation: Cleaning and disinfection**
- **Herd testing until disease eliminated**
- **Vaccination as applicable**
- **Epidemiologic Investigations and follow up to detection of infection**

Control of Human Brucellosis

- **Addressing in domestic livestock most economical approach**
  - **in 1 study benefit:cost ratio of 3.2 for vaccination (Roth et al 2004)**
- **Pasturization of milk products**
- **Precautions taken to prevent direct transmission**

Summary

- **Brucellosis control programs require a coordinated, committed regulatory framework**
- **Benefits include: reduced human disease, greater economic returns for livestock owner, possible improved trade opportunities**

Comparison of Strains RB51 and 19 Vaccines in Cattle

	Strain 19	**Strain RB51**
Serology on Standard Brucellosis Tests	Positive; Prolonged high titers with booster vaccination	Negative, even on booster vaccination
Clearance *in vivo*		Approx. 12 weeks
Pathogenicity	Moderate to High	Low
Efficacy	Good	Similar to Strain 19
Zoonotic Characteristics	Significant Human Pathogen	Reduced Pathogenicity as compared to strain 19
Use in Pregnant Cattle	Low Dose may cause significant abortions and high titers	Occasional abortions